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Parent-Assisted Instruction in a Motor Skill Program for At-Risk Preschool Children

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The purpose was to investigate the effectiveness of parental involvement on the acquisition of object-control skills of preschool children who are at risk for developmental delay or academic failure. The experimental group ($n = 15$) participated in an 8-week motor skill intervention program consisting of two 45-min lessons per week delivered by the children's parents. The control group ($n = 12$) participated in the regular motor skill program, which consisted of movement songs delivered by the parents. All children were pretested and posttested on the object-control subscale of the Test of Gross Motor Development (Ulrich, 1985). Both groups performed in the lower 20th percentile on the pretest. A 2×2 (Group $\times$ Test) ANOVA revealed that the experimental group improved significantly in the object-control subscale score from pretest to posttest, whereas the control group did not change. The results provide support for including parents in the instructional process of children who are at risk for developmental delay or academic failure.

Recognizing the importance of early intervention, the federal government enacted PL 99-457 in 1986 to extend educational services to infants, toddlers, and preschool-aged children with disabilities or developmental delays and those at risk for developmental delays (Cowden & Eason, 1991). Today, the Individuals with Disabilities Education Amendments (PL 105-17, 1997) Parts C and H, support such services. The term *developmental delay* was introduced by the federal legislation to allow states to develop their own criteria for performance below

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acceptable standards. According to law, developmental delays may occur in one or more of the five areas specified by the law: cognitive, physical, language and speech, psychosocial or emotional, and self-help skills. Illustrative criteria for diagnosis of developmental delays are (a) statistical criteria that show a performance is 1.5 standard deviations below the mean of peers, (b) performance scores below the 30th percentile, (c) systematic observation by qualified professionals, and (d) parent reports (Sherrill, 1998).

The term *at risk for developmental delay* refers to exposure to biological or environmental influences that predispose children to a greater probability of developmental delay or educational failure. Biological risk factors may include otitis media, chronic illness, low birth weight, or a diagnosed genetic condition. Environmental risk factors, which are related to the context in which a child lives, may include poverty, death of a parent, living conditions, or the substance abuse of a parent. Environmental and biological factors may influence the context in which a child develops. Multiple environmental and biological risk factors may interact and create an ecology that impinges upon the healthy development of children. From an ecological systems perspective, schools cannot erase biological or environmental risk factors. However, the at-risk status may be modified by helping children to create protective factors that mediate their resilience to risk (Comer & Haynes, 1991). Health and wellness can be considered critical protective factors (Swick & Graves, 1993; Taras, 1992).

Health and wellness are the substance of strong children and functional families (Stinnet, 1981; Swick & Graves, 1993). A healthy individual is more likely to be able to combat everyday stresses. The contribution of physical activity to health and well-being of children and adults has been well substantiated (Cresanta et al., 1986; Poest, Williams, Witt, & Atwood, 1990; Sallis & McKenzie, 1991; Taras, 1992). Participation in physical activities may help to prevent cardiovascular diseases, many of which originate in early childhood.

From a developmental perspective, activities for young children should not be the same as those for adults. Physical activities should be commensurate with the abilities, needs, and interests of children. Participation in organized physical activity programs in childhood often depends upon the success a child has in performing fundamental motor skills (Branta, Haubenstricker, & Seefeldt, 1984; Seefeldt, 1994). Children who are not proficient in motor skills are not likely to participate in activities in which these skills are required. Unfortunately, a common misconception of early childhood educators and parents is that motor skills emerge solely as part of the growth and maturation of the child (Reuschlein & Haubenstricker, 1985). Children who are delayed in motor skills may especially need remediation, intervention, and instruction to develop competent fundamental motor skills (Cowden, Sayers, & Torrey, 1998; Goodway-Shiebler, 1994).

The efficacy literature on early intervention demonstrates that beneficial effects of intervening early in the lives of young children who are disadvantaged, developmentally delayed, at risk, and disabled (Casto & White, 1984; Cowden et al., 1998; Guralinick, 1991; Odom, 1988; Orr, 1990; Sayers, Cowden, Newton, Warren, & Eason, 1996; Stedman, 1988; White & Casto, 1985). A meta-analysis of 162 early intervention studies conducted on 316 research articles involving children who were disadvantaged, were at-risk, or had disabilities indicated substantial effect sizes resulting from the interventions (White & Casto, 1985). This meta-analysis included school- and community-based interventions focusing

primarily on social and cognitive variables. The literature also suggests that early intervention is a cost-effective way to meet the needs of children who are at risk and counter the detrimental impact of their environments (Guralinick, 1991; Stedman, 1988; White & Casto, 1985).

Motor Skill Interventions

A limited number of studies have documented that carefully planned interventions can help children acquire motor skills in early childhood (Goodway-Shiebler, 1994; Kelly, Dagger, & Walkley, 1989; Sayers et al., 1996; Zittel & McCubbin, 1996). In a study of 59 preschool children enrolled in an at-risk prekindergarten program, Goodway-Shiebler (1994) reported significant gains in fundamental motor skills following a 12-week, teacher-directed motor skill intervention. Pretest and posttest data were collected using the Test of Gross Motor Development (TGMD) of Ulrich (1985). Over the course of the intervention, the experimental group ($n = 30$) improved from the 15th to the 80th percentile in locomotor skill performance and from the 17th to the 80th percentile in object-control performance. The control group ($n = 29$) demonstrated no significant gains in performance. Kelly et al. (1989) investigated the effect of an instructional program on the motor skill acquisition of 21 typically developing preschool-aged children. Significant qualitative and quantitative gains were found on six motor skills taught to the experimental group, whereas the control group ($n = 26$) showed no significant gains in performance.

Zittel and McCubbin (1996) used a single-subject design to study the effects of an 8-week motor skill intervention on motor skill acquisition using the I CAN curriculum on 4 developmentally delayed children. No change occurred in the presence of critical elements due to the intervention in the integrated or the segregated condition. The authors attributed one cause to the lack of opportunities for children to practice skills. Other possible reasons for the lack of increase in skill acquisition could be the small number of participants in this study.

Sayers et al. (1996) investigated the effects of an 8-week, structured, parent-delivered motor skill intervention on the development of stepping movements of 4 infants with Down syndrome. Sayers et al. (1996) indicated that parents were able to deliver home-based instruction that increased and exceeded the children's expected rate of motor development. Although the acquisition of independent upright locomotion of infants with Down syndrome is individual, these infants clearly improved. All of the studies support the use of structured motor skill interventions to develop fundamental motor skills for preschool-aged children with or without developmental delays. However, in these studies, with one exception (Sayers et al., 1996), teachers were the primary agents of instructional delivery.

Parent Involvement in Intervention Programs

The meta-analysis by White and Casto (1985) identified parental involvement as an important factor in the success of early intervention programs. A frequently cited indicator of quality preschool programs is the involvement of parents (National Association for the Education of Young Children, 1991; National Association of the State Boards of Education, 1991). The value of including parents is advocated by national policymakers, as evidenced by such legislation as PL 99-457

(1986) and PL 105-17 (1997). In a review of the literature, Shonkoff and Houser-Cram (1987) found support for the positive effect of parental involvement in 31 early intervention programs. Shonkoff and Houser-Cram found a differential effect size with respect to parental involvement in early childhood programs. With no parental involvement, the effect size for cognitive gains from the intervention was 0.31 *SD*; however, if parents were involved, the effect size increased to 0.74 *SD*.

Parental involvement is also important in remediating developmental delays in children who are at risk. Seligman (1988) and Williams (1987) highlighted the child-parent relationship as central to success in remediation for at-risk infants. Parental involvement has been attributed also to increasing school readiness in young children. In a study of prekindergarten minority children who were at risk, Waxler, Thompsom, and Poblete (1990) used parents as educators in facilitating the transition of children from Head Start to kindergarten. Children whose parents were involved in the 4-week transition program demonstrated greater readiness for school than low-income children without parental involvement. The literature clearly indicates that children who are at risk can benefit from the involvement of a parent in their educational program.

From an ecological systems perspective, involving parents in the education of young children can be beneficial (Cowden et al., 1998; Swick & Graves, 1993; Powell, 1989). Parents are an integral part of a young child's context. In fact, Trout and Foley (1989) recognized the family as the ecological system that is most critical to the child's optimal development. Stedman (1988) supported this view and suggested that parental involvement in education facilitates child development. Cowden et al. (1998) described a pediatric motor development and exercise program in which parents played a key role in facilitating child development. Although parental involvement has been identified as an important factor in early childhood interventions, little research has focused on the systematic use of parents in a motor development intervention. Thus, the purpose of this study was to determine the effect of parent-assisted instruction on the acquisition of object-control skills of at-risk preschool children.

Method

Participants

The sampling design was intact classes. This study was conducted in a midwestern urban school district in a predominantly inner-city African-American community. Two compensatory preschools provided participants for this study. The preschools, feeder facilities to a Head Start Program and an at-risk prekindergarten program, were partially funded through block grants established by PL 102-119 (1991) with the intent to prevent educational failure in children. Parents were required to attend school with their children as a condition of enrollment in the program. Parents tutored their children on academic readiness skills such as letter, number, and color recognition and on fine motor skills such as scissors cutting and shoelace tying. Children attended school twice per week for 3.5 hr. Parents were required to be at the school for the entire time. All participants were between the ages of 3 to 5 years.

Participants were 27 children in five intact classes. To eliminate potential school effects, two intact groups, one from each school, were randomly assigned

to the control group. The remaining three intact groups, two from the first school and one from the second school, were assigned to the experimental group. Fifteen children, 6 girls and 9 boys, participated in the experimental group, ranging in age from 41 to 50 months ($M = 47.1$, $SD = 2.5$ months). Twelve children, 5 girls and 7 boys, participated in the control group, which ranged in age from 39 to 55 months ($M = 47.5$ months, $SD = 3.9$). None of the children were involved in motor skill programs outside of school during the time of the intervention. In addition, children's participation in physical activity at home was very limited. This study was conducted during the winter months of a northern city. Many of the children lived in small houses or apartments that were not conducive to movement, and parents discouraged children from being active at home.

At-risk status for the children in the school was determined by residence in the at-risk community surrounding the schools and by parent interviews. The demographic data provided by the school indicated the community was 99% African-American, with 37% of the residents living in poverty. Single females headed 41% of the households in this community. Aid for Dependent Children (AFDC) was provided to 57% of the households, and 41% of all children received a free lunch. The unemployment rate was 21%. Only 5% were college graduates, and 62% were high school graduates. Parents who reported two or more risk factors were considered by the district to have an "at-risk" status. The percentages of parents and children who met each criterion for the experimental and control groups are reported in Table 1.

Informed consent for participation in the study was obtained from each caretaker or parent. Of the 27 parents who consented to be involved in the study, 25 were biological mothers and 2 were grandmothers. Consent was also obtained from each child. Prior to the investigation, human subjects approval was obtained from the Institutional Review Board involving human subjects.

Instrumentation

The TGMD (Ulrich, 1985) was used to assess performance on five object-control skills (e.g., kicking, throwing, bouncing, striking, and catching) for the pretest and posttest. The TGMD is a standardized, criterion-based test using normative data from a stratified sampling of 909 children ages 3 to 10. The total raw score possible on the object-control subscale is 19 points. The standardized instructions for administering the test items were followed. A split-half reliability coefficient of .78 has been reported for the object-control portion of the TGMD (Ulrich, 1985). Content validity on the TGMD was established by three experts in the field of motor development who rated the items independently. Construct validity on the subscales by factor analysis was established also (Ulrich, 1985).

Procedure

The primary investigator removed children individually from the classroom to administer the TGMD for the pretest and posttest. A classroom aide videotaped the children's performance on each of the five skills so that the tapes could be viewed later. All videotapes were independently rated on the pretest and posttest by two raters and the first investigator to eliminate experimenter bias. Two of the raters were blind to the participant's placement in either the experimental or control group.

Table 1 Percentage of Participants Demonstrating Risk Factors

Factor	% Experimental group	% Control group
Low income (poverty guidelines)	100	100
Single parent	86	83
Unemployed	73	75
Dangerous living conditions	100	83
Lack of health insurance	73	83
Limited prenatal care	86	75
Adolescent mother	66	58
Lack of paternal support (financial)	93	83
Education less than 12 th grade	26	33
Family members incarcerated	13	16
Chronic otitis media	33	25
Physical abuse	06	0
Sexual abuse	0	0
Diagnosed genetic problems	13	0
Health or chronic illness	26	16
Premature birth	20	16
Small for gestational age	13	08

All three raters (including the primary investigator) were experts in motor development.

To determine the consistency between raters on the criterion-referenced TGMD, Cohen's kappa was used (Cohen, 1960). Cohen's kappa is a measure of interrater agreement that examines the degree to which the congruence of responses is greater than what would be expected by chance alone. It is constructed as the ratio of difference between the observed number of cases in agreement and the expected number of cases in agreement to the difference between total sample size and expected numbers of cases in agreement. Kappa values may range from 0 to 1. Values greater than .75 indicate strong agreement between raters, values between .40 and .75 fair to good agreement, and values below .40 poor agreement. Kappa values calculated for this study ranged from .88 to .95, indicating strong agreement.

The experimental group participated in a parent-assisted motor skill intervention at the preschool conducted over 8 weeks, consisting of 16 45-min lessons. The experimental design was a quasi-experimental design using a nonequivalent control group. A real-world design was used because the groups could not be randomly formed (Thomas & Nelson, 1996). Two 45-min sessions a week were chosen as the intervention format based on procedures described in related research (Goodway-Shiebler, 1994; Kelly et al., 1989). Mothers of the children in the experimental group tutored their children on throwing, kicking, catching, striking, and bouncing, emphasizing the mature elements of form. A performance-based curriculum was used, which also focuses on the mature elements of form. A similar

approach was used by Kelly et al. (1989), who followed the I CAN curriculum (Wessel, 1976).

A systems approach was used to identify curricular objectives, determine instructional time per skill, design instructional lessons for the parents to deliver to the children, and provide the parents with key teaching points prior to each lesson. Two 45-min parent orientation meetings were held before the study began, the purpose of which was to familiarize parents with the five skills that would be taught over the 8-week period. The performance criteria for each of the five skills identified by the TGMD (Ulrich, 1985) were presented to the parents. Parents were provided an opportunity to ask questions and practice the skills after each criterion was presented. In addition, the parents' performance was monitored by the primary investigator daily, and feedback was given to ensure that parents understood the skills.

The parent's primary role in the motor skill intervention was to deliver the lesson plan to her child. The lesson plan was provided to the parent by the primary investigator. To facilitate implementation of the lesson plan, parents attended a 15-min session prior to teaching each lesson. During that time, two skills were presented to parents to teach during the lesson. A visual and verbal demonstration was provided by the investigator for each lesson. Equipment and stations were set up around the gymnasium to facilitate the activity. Parents were provided with time for questions and answers following each lesson and each demonstration.

The total instructional time designated for skill development was 480 min with an additional 160 min spent in opening and closing activities. A total of 100 min was appropriated for each of the skills of throwing, catching, striking, and kicking. A total of 80 min was assigned to the skill of bouncing. Approximately 10 min per class was allowed for transitions between activities and instruction management tasks. A minimum of two skills was taught by mothers to their children during each class session. Specific components of the skill were emphasized during each lesson. The primary investigator was present while mothers delivered the lessons. Feedback was given to parents who incorrectly performed a skill or who asked for assistance from the primary investigator.

The control group received the regular activity program provided to children in the prekindergarten classroom. This program consisted of (a) movement songs and activities in which the parents and children participated together and (b) opportunities for movement exploration by the children. Various-sized balls and bats were available to children and were placed where they were easily accessible in the classroom. However, no instruction on any of the object-control skills was provided. The movement program during the 8-week period consisted of 16 sessions approximately 45 min in length.

Results

The raw, standard, and percentile scores for pretest and posttest performance on the object-control subscale of the TGMD for participants in the experimental and control groups are reported in Table 2. Standard and percentile scores were calculated using the normative scores based on age provided by the TGMD (Ulrich, 1985)

The object-control subscale means for the pretest were similar for the two groups. Both groups performed below the 20th percentile on the pretest when

Table 2 Pretest and Posttest Performance on the Object-Control Subscale of the TGMD

Score	Group	Pretest		Posttest	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Raw	Experimental	2.82	2.06	6.19	3.08
	Control	2.72	1.67	2.66	1.93
Percentile	Experimental	19.80	29.18	67.33	29.37
	Control	17.91	24.42	5.08	24.03
Standard	Experimental	6.53	3.31	12.06	3.49
	Control	5.83	3.21	5.00	3.04

Note. Raw scores range from 0 to 19 points. Standard scores range from 1 to 20.

Table 3 Pretest and Posttest Mean Raw Scores for Individual Object-Control Skills by Group

Skill	Maximum no. of points	Experimental group		Control group	
		Pretest	Posttest	Pretest	Posttest
Catch	4	1.27	1.87	0.83	1.08
Throw	4	0.13	1.00	0.25	0.17
Kick	4	0.20	1.00	0.17	0.08
Strike	4	0.87	1.53	1.30	1.00
Bounce	3	0.40	0.80	0.17	0.33
Total	19	2.82	6.19	2.72	2.66

Note. Raw scores range from 0 to 19 points. Standard scores range from 1 to 20.

compared to same-age peers from the TGMD normative sample. On the posttest, the experimental group advanced to the 67th percentile, whereas the control group was at the 15th percentile. Standard scores were calculated to adjust performance based upon children's age. The mean raw scores for each of the five object-control skills and for the object-control total score are reported in Table 3.

A 2×2 (Group $\times$ Test) ANOVA with repeated measures on the second factor was conducted on the object-control standardized score. The results indicated a significant group effect, $F(1, 26) = 12.55, p < .002$, and test effect, $F(1, 26) = 13.18, p < .001$. There was also a significant group by test interaction, $F(1, 26) = 24.18, p < .002$. This interaction was due to the improvement of the experimental group across the intervention period, whereas the control group did not change across the intervention period. The effect sizes were .97 for group, 1.14 for test, and 1.85 for group by test interaction. These three effect sizes can be interpreted as high.

Discussion

Currently, many resources are being invested in compensatory programming to meet the needs of children who demonstrate risk factors that may lead to academic failure or developmental delay. The physical/motor domain has been identified as one of the five areas of developmental delay (PL 99-457, 1986; PL 105-17, 1997). Despite a substantial body of literature on early intervention (Casto & White, 1984; Cowden et al., 1998; Guralinick, 1991; Odom, 1988; White & Casto, 1985; Zittel & McCubbin, 1996), little is reported about the developmental status of preschool children who are at risk in the motor skill area. To effectively intervene in the lives of these children, it is critical to plan a motor skill program based upon empirical evidence. The purpose of this study was to determine the effect of parent-assisted instruction on the acquisition of object-control skills by children who are at risk.

The need for motor skill instruction among children who are at risk was clearly documented by the pretest data, which revealed that both the experimental and control groups performed at or below the 20th percentile on the TGMD (Ulrich, 1985) and thus were clearly delayed in motor skills. Further inspection of the data indicated that 59% of the children who participated in this study performed at or below the 5th percentile for their respective age groups. The motor skill delay documented in this study corroborates the findings by Goodway-Shiebler (1994), who evaluated similar populations of at-risk children. The developmental delay documented in the current study may be attributed, in part, to insufficient opportunities for physical activities. Parents indicated that their children did not participate in outdoor activities for safety reasons and were not receiving formal motor skill instruction. Additionally, most of the children in the study showed little familiarity with the skills of the TGMD prior to the intervention.

Statistical analysis of the parent-assisted motor skill intervention revealed gains in object-control total score from pretest to posttest by the experimental group. In contrast, the control group demonstrated little or no change in the object-control total score. Comparison of the mean percentile rank scores obtained by the experimental group on the posttest ($M = 67.33$) to the mean score on the pretest ($M = 19.80$) indicates the dramatic improvements that occurred as a result of the parent-assisted intervention. In fact, 60% of the experimental group performed at or above the 75th percentile following the motor skill intervention. In contrast, the percentile scores for the control group on the pretest ($M = 17.01$) were similar to those on the posttest ($M = 15.08$). Only 8% of the control group performed at or above the 50th percentile.

The changes in the object-control total score demonstrated by the experimental group are attributed to the two 45-min instructional sessions per week. We acknowledge that more frequent 30-min instructional sessions would be more developmentally appropriate for children. However, it is important to recognize the constraints of the context. The preschool was in session for 3.5 hr per week, two times a week. The teachers had allocated time during the day for physical activity and parent-child interaction. We chose not to alter the existing time allocated for the activities and worked within the existing time frames that were established. Despite the logistical constraints in the context, the intervention still brought about educationally significant changes in motor skill acquisition.

These findings agree with others reported in the literature (Goodway-Shiebler, 1994; Kelly et al., 1989) suggesting that not only may significant gains be achieved

through motor skill interventions but, more importantly, parents can be used to enhance motor skill performance. In fact, these improvements were elicited by a group of parents who themselves contributed to the at-risk status of their children. We do not believe that parents should be used to replace teacher instruction, but parents may be used to enhance the instructional climate both by acting as role models and by providing individualized instruction for their children.

The findings not only support the concept of parent involvement but also have practical relevance. Often schools seek ways to increase participation of parents whose children are at risk for developmental delay and school failure. These parents, who have themselves experienced failure within the school system, are often threatened by involvement in education of their children. Motor skill interventions may be a nonthreatening means to increase parental involvement.

From an instructional perspective, it seems pertinent to examine not only the amount of change that took place as a result of the intervention but also the skills in which the change occurred. Specifically, change was evident in all five of the object-control skills tested in the study. At the end of the intervention, the experimental group had mastered approximately one third (6.19 out of a possible 19 points) of the elements of mature form assessed by the TGMD. Given that many of the elements of form would not be expected to be mastered by children this young, this seems to be quite a remarkable finding. The greatest change in raw mean scores from pretest to posttest was throwing (.87) and kicking (.80) followed by striking (.66), catching (.60), and bouncing (.40). The lesser amount of change found in bouncing may be a product of instructional time spent on the skill (80 min) or the simple lack of readiness for complex manipulative skills.

An 8-week, parent-assisted motor skill intervention improved the object-control skills of young children identified as at risk for school failure or developmental delay. Parents, mentored by professionals, can be effective instructors of their children's motor skill development, as demonstrated by the substantial gains in motor performance that occurred in the experimental group.

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